

Amendment A

Inventor: Neil A. Winegarden

Attorney Docket No.: 718188.1

ER 45. The assembly of claim 44, wherein the turbulence means comprises i) aligning means for aligning the spotting members proximate to the apertures with each spotting member body extending generally axially away from the corresponding aperture, ii) reciprocating means for reciprocating the spotting members generally axially toward and away from the apertures and iii) a vacuum means for drawing air around the spotting members to flow through the apertures.

ER 46. The assembly of claim 45, wherein the vacuum means comprises a source of vacuum and a structure for coupling the plate to communicate with the source of vacuum to draw liquid from the microarray spotting members through the apertures.

ER 47. The assembly of claim 44, wherein the apertures comprise channels, each channel defining an inlet and an outlet in fluid communication.

¹⁰³ER 48. The assembly of claim 47, wherein the apertures are arranged in parallel rows.

¹⁰³ER 49. The assembly of claim 44 or 45, wherein the spotting members comprise pins.

¹⁰³ER 50. The assembly of claim 49, wherein the pins are selected from the group consisting of solid pins and split pins. *new matter*

¹⁰³ER 51. The assembly of claim 44, comprising 48 apertures capable of simultaneously removing liquid from 48 spotting members.

¹⁰³ER 52. The assembly of claim 44, comprising 32 apertures capable of simultaneously removing liquid from 32 spotting members.

53. The assembly of claim 47, further comprising a cover secured parallel to the plate over the inlets, the cover defining a plurality of cover apertures therethrough, each cover aperture concentric with an inlet of the plate, and the diameter of each cover aperture being less than

the diameter of its concentric inlet.

ER 54. The assembly of claim ~~44~~ or 45, wherein the first open end portion is tapered.

ER 55. The assembly of claim 54, wherein approximately half of the tapered first open end portion is adapted to extend into the aperture.

ER 56. The assembly of claim ~~44~~ or 45, wherein the first open end portion comprises a tip and the spotting member is reciprocable by the reciprocating means between first and second positions, the tip located outside the aperture in the first position and the tip located inside the aperture in the second position.

ER 57. The assembly of claim 44, wherein the source of vacuum pressure provides a pressure of 50 to 90 psi.

ER 58. The assembly of claim 44, wherein the source of vacuum pressure provides a pressure of 60 psi.

ER 59. The assembly of claim 44, wherein the source of vacuum pressure provides a pressure of at least 90 psi. *New matter*

ER 60. A microarrayer comprising the manifold assembly of claim 44 or 45.

ER 61. A method of removing liquid from a plurality of microarray spotting members, comprising applying a source of vacuum to the assembly of claim 44 or 45 and reciprocating the microarray spotting members proximate to the apertures of the manifold to create air flow and turbulence between the spotting members and the apertures.

ER 62. The method of claim 61, wherein the spotting members are concentric with the apertures during reciprocation.

ER¹⁰³ 63. The method of claim 61, wherein the spotting members are about 100 micrometers away from the inlet prior to reciprocation.

ER¹⁰³ 64. The method of claim 61, wherein the spotting members are reciprocated about a distance of 1 mm.

ER 65. The method of claim 61, wherein each spotting member includes a tapered first open end portion adapted to extend into the aperture, the tapered first open end portion received in the aperture during at least part of the reciprocation.

ER 66. The method of claim 65, wherein the first tapered open end portion reciprocates in and out of the aperture.

ER 67. The method of claim 61, wherein each spotting member includes a tapered first open end portion adapted to extend into the aperture, the tapered first open end portion spaced apart from the aperture during reciprocation.

ER 68. A method of removing liquid from a plurality of microarray spotting members, the spotting members each having a spotting member body having a second diameter and a first open end portion for printing a spot on a microarray slide, the liquid removed through a manifold having a plurality of apertures extending therethrough, the apertures having an axis and a first diameter, wherein the second diameter is greater than the first diameter, the method comprising:

first generally axially aligning the spotting members proximate to the manifold apertures with each spotting member body extending generally axially away from the apertures;

applying a vacuum for drawing air around the spotting members through the apertures;
and

reciprocating the spotting members generally toward and away from the corresponding apertures,

wherein turbulence is created between the spotting members and the apertures for removing liquid from the first open ends of the spotting members through the apertures.

6 R 69. The method of claim 68, wherein the spotting member is reciprocated between first and second positions, the tip outside the aperture in the first position and the tip inside the aperture in the second position.

ER 70. A manifold for use with a microarray spotting apparatus for removing liquid from microarray spotting members, the microarray spotting members each having a spotting member body having a second diameter and a first open end portion for printing a spot on a microarray slide, the manifold comprising: a plate, the plate defining a plurality of fluid flow apertures extending through the plate, the apertures having a first diameter, wherein the second diameter is greater than the first diameter, and wherein the first open end of the spotting member is adapted to extend into the corresponding aperture.

3R 71. The manifold of claim 70, wherein the apertures comprise channels, each channel defining an inlet and an outlet in fluid communication.

102
6 R 72. The manifold of claim 70, wherein the apertures are arranged in parallel rows.

4R 73. The manifold of claim 70, comprising 48 apertures capable of simultaneously removing liquid from 48 spotting members. New matter

103
ER 74. The manifold of claim 70, comprising 32 apertures capable of simultaneously removing liquid from 32 spotting members.

UR 75. A vacuum manifold for removing liquid from microarray spotting members, comprising:

a plate defining a plurality of fluid flow channel members formed through the plate, each channel member defining an inlet and an outlet in fluid communication, wherein the diameter of the inlet is less than the spotting member diameter, and the spotting member includes a first tapered open end, a portion of the first tapered open end capable of extending into the inlet and the fluid flow channel member; and

structure for coupling the plate to communicate with a source of vacuum to draw fluid from the microarray spotting members through the fluid flow channel members.

¹⁰³
UR 76. The vacuum manifold of claim 75, wherein the channel members are arranged in parallel rows.

¹⁰³
UR 77. The vacuum manifold of claim 75, wherein the spotting members comprise pins.

¹⁰³
ER 78. The vacuum manifold of claim 75, comprising 48 fluid flow channel members capable of simultaneously removing liquid from 48 spotting members.

¹⁰³
UR 79. The vacuum manifold of claim 75, wherein the vacuum provides a pressure of 50 to 90 psi.

¹⁰³
ER 80. The vacuum manifold of claim 75, wherein the vacuum provides a pressure of 60 psi.

¹⁰³
ER 81. The vacuum manifold of claim 75, wherein the vacuum provides a pressure of at least 90 psi.

¹⁰³
UR 82. A microarrayer comprising the vacuum manifold of claim 75.

¹⁰³
UR 83. A method of removing liquid from a plurality of microarray spotting members, comprising:

applying a source of vacuum to a vacuum manifold for removing liquid from microarray spotting members, the vacuum manifold comprising a) a plate defining a plurality of fluid flow channel members formed through the plate, each channel member defining an inlet and an outlet in fluid communication, wherein the diameter of the inlet is less than the spotting

member diameter, and the spotting member includes a first tapered open end, a portion of the first tapered open end capable of extending into the inlet and the fluid flow channel member; and b) structure for coupling the plate to communicate with a source of vacuum to draw fluid from the microarray spotting members through the fluid flow channel members; and

reciprocating the microarray spotting members proximate to the inlets of the manifold to create air turbulence between the spotting members and the inlets.

GR 84. The method of claim 83, wherein the each microarray spotting member is concentric with the inlet during reciprocation.

ER 85. The method of claim 83, wherein the spotting members are about 100 micrometers away from the inlet prior to reciprocation.

ER 86. The method of claim 83, wherein the spotting members are reciprocated about a distance of 1 mm.

BR 87. The method of claim 83, wherein each spotting member includes a first tapered open end having a portion capable of extending into the inlet, the first tapered open end portion received in the inlet during reciprocation.

ER 88. The method of claim 87, wherein the first tapered open end portion reciprocates in and out of the inlet.

89. A microarrayer substrate with a surface comprising 3000 or more groups of DNA molecules attached to the surface in discrete known regions, the 3000 or more groups of DNA molecules occupying a total area of less than 1 cm² on the substrate.